

SEQUENCE LISTING

SEQ ID NO: 1
HDEL (peptide)

5 SEQ ID NO: 2

Pichia pastoris OCH1 gene

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1 AGATCTGCCT GACAGCCTTA AAGAGCCCGC TAAAAGACCC GGAAAACCGA GAGAAGCTCTG
61 GATTAGCAGT CTGAAAAAGA ATCTTCACTC TGTCTAGTGG AGCAATTAAT GTCTTAGCGG
121 CACTTCCTGC TACTCCGCCA GCTACTCCTG AATAGATCAC ATACTGCAAA GACTGCTTGT
10 181 CGATGACCTT GGGGTATTAT AGCTTCAAGG GCAATTTTTG GGACATTTTG GACACAGGAG
241 ACTCAGAAAC AGACACAGAG CGTTCGAGT CCTGGTGCTC CTGACGTAGG CCTAGAACAG
301 GAATTATTGG CTTTATTGTG TTGTCCATTT CATAGGCTTG GGGTAATAGA TAGATGACAG
361 AGAAATAGAG AAGACCTAAT ATTTTTTGTT CATGGCAAAT CGCGGGTTCG CGGTCCGGTC
421 ACACACGGAG AAGTAATGAG AAGAGCTGGT AATCTGGGGT AAAAGGGTTC AAAAGAAGGT
15 481 CGCCTGGTAG GGATGCAATA CAAGGTTGTC TTGGAGTTTA CATTGACCAG ATGATTGGGC
541 TTTTCTCTG TTCAATTCAC ATTTTTCAGC GAGAATCGGA TTGACGGAGA AATGGCGGGG
601 TGTGGGGTGG ATAGATGGCA GAAATGCTCG CAATCACCGC GAAAGAAAGA CTTTATGGAA
661 TAGAACTACT GGGTGGTGTA AGGATTACAT AGCTAGTCCA ATGGAGTCCG TTGGAAAGGT
721 AAGAAGAAGC TAAAACCGGC TAAGTAACTA GGAAGAATG ATCAGACTTT GATTTGATGA
20 781 GGTCTGAAAA TACTCTGCTG CTTTTTCAGT TGCTTTTCC CTGCAACCTA TCATTTTCCT
841 TTTTCATAAGC CTGCCTTTTC TGTTTTCAGT TATATGAGTT CCGCCGAGAC TTCCCCAAAT
901 TCTCTCCTGG AACATCTCTC ATCGCTCTCC TTCCAAGTTG CGCCCCCTGG CACTGCCTAG
961 TAATATTACC ACGCGACTTA TATTCAGTTC CACAATTTCC AGTGTTCTGA GCAAATATCA
1021 TCAGCCATGG CGAAGGCAGA TGGCAGTTTG CTCTACTATA ATCCTCACAA TCCACCCAGA
25 1081 AGGTATTACT TCTACATGGC TATATTCGCC GTTCTGTGTA TTGCGTTTTT GTACGGACCC
1141 TCACAACAAT TATCATCTCC AAAAATAGAC TATGATCCAT TGACGCTCCG ATCACTTGAT
1201 TTGAAGACTT TGGAAGCTCC TTCACAGTTG AGTCCAGGCA CCGTAGAAGA TAATCTTCGA
1261 AGACAATTGG AGTTTCATTT TCCTTACCGC AGTTACGAAC CTTTTCCCCA ACATATTTGG
1321 CAAACGTGGA AAGTTTCTCC CTCTGATAGT TCCTTTCCGA AAAAAGTTCA AGACTTAGGT
30 1381 GAAAGTTGGC TGCAAAGGTC CCCAAATTAT GATCATTTTG TGATACCCGA TGATGCAGCA
1441 TGGGAACTTA TTCACCATGA ATACGAACGT GTACCAGAAG TCTTGGAAGC TTTCCACCTG
1501 CTACCAGAGC CCATTCTAAA GGCCGATTTT TTCAGGTATT TGATTCTTTT TGCCCGTGGA
1561 GGACTGTATG CTGACATGGA CACTATGTGA TTA AAAACCAA TAGAATCGTG GCTGACTTTC
1621 AATGAACTA TTGGTGGAGT AAAAAACAAT GCTGGGTTGG TCATTGGTAT TGAGGCTGAT
35 1681 CCTGATAGAC CTGATTGGCA CGACTGGTAT GCTAGAAGGA TACAATTTTG CCAATGGGCA
1741 ATTCAGTCCA AACGAGGACA CCCAGCACTG CGTGAAGTGA TTGTAAGAGT TGTCAGCAGC
1801 ACTTTACGGA AAGAGAAAAG CGGTACTTGG AACATGGTGG AAGGAAAGGA TCGTGGAAGT
1861 GATGTGATGG ACTGGACGGG TCCAGGAATA TTTACAGACA CTCTATTTGA TTATATGACT
1921 AATGTCAATA CAACAGGCCA CTCAGGCCAA GGAATTGGAG CTGGCTCAGC GTATTACAAT
40 1981 GCCTTATCGT TGGAAGAACG TGATGCCCTC TCTGCCCGCC CGAACGGAGA GATGTTAAAA
2041 GAGAAAAGTCC CAGGTAAATA TGCACAGCAG GTTGTTTTAT GGAACAATT TACCAACCTG
2101 CGCTCCCCCA AATTAATCGA CGATATTCTT ATTCTTCCGA TCACCAGCTT CAGTCCAGGG
2161 ATTGGCCACA GTGGAGCTGG AGATTGTAAC CATCACCTTG CATATATTAG GCATACATTT
2221 GAAGGAAGTT GGAAGGACTA AAGAAAGCTA GAGTAAATA GATATAGCGA GATTAGAGAA
45 2281 TGAATACCTT CTTCTAAGCG ATCGTCCGTC ATCATAGAAT ATCATGGACT GTATAGTTTT
2341 TTTTGTGTAC ATATAATGAT TAAACGGTCA TCCAACATCT CGTTGACAGA TCTCTCAGTA
2401 CGCGAAATCC CTGACTATCA AAGCAAGAAC CGATGAAGAA AAAAACAACA GTAACCCAAA
2461 CACCACAACA AACACTTTAT CTTCTCCCCC CCAACACCAA TCATCAAAGA GATGTCGGAA
2521 CACAAACACC AAGAAGCAAA AACTAACCCC ATATAAAAAC ATCCTGGTAG ATAATGCTGG
50 2581 TAACCCGCTC TCCTTCCATA TTCTGGGCTA CTTACGAAG TCTGACCGGT CTCAGTTGAT
2641 CAACATGATC CTCGAAATGG GTGGCAAGCA TCGTTCCAGA CCTGCCTCCT CTGGTAGATG
2701 GAGTGTGTGTT TTTGACAGGG GATTACAAGT CTATTGATGA AGATACCTTA AAGCAACTGG
2761 GGGACGTTCC AATATACAGA GACTCCTTCA TCTACCAGTG TTTGTGTCAC AAGACATCTC
55 2821 TTCCCATGTA CACTTCCGA ATTGACAAGA ACGTCGAC

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SEQ ID NO: 3

Pichia pastoris alpha-1,6-mannosyltransferase encoded by the OCH1 gene
(nt 1027-2241)

MAKADGSLLYNPHNPPRRYYFYMAIFAVSVICVLYGPSQQLSSPKIDYDPLTLRSLDLKTLEAPSQLSPG
TVEDNLRRLQLEFHFYPYRSYEPFPQHIWQTKVSPSDSSFKNFKDLGESWLQSRPNYDHFVIPDDAAWELI
HHEYERVPEVLEAFHLLPEPILKADFFRYLILFARGGLYADMDTMLLKPIESWLTNETIGGVKNNAGLVI
GIEADPDRPDWHDWYARRIQFCQWAIQSKRGHPALRELIVRVSTTLRKEKSGYLMNVEGKDRGSDVMDWT
5 GPGIFTDTLFDYMTNVNTTGHSGQGIGAGSAYYNALSLEERDALSARPNGEMLKEKVPGKYAQQVVLWEQF
TNLRSPKLIDDILILPITSFSPGIGHSGAGDLNHHLAYIRHTFEGSWKD

SEQ ID NO: 4

5' GGAATTCAGCATGGAGTATGGATCATGGAGTCCGTTGGAAAGG

SEQ ID NO: 5

5' GCCGCTCGAGCTAGCTTTCTTTAGTCC

SEQ ID NO: 6

Plasmid pGlycoSwitchM8 (2875 bp)

AGATCTAACATCCATAATCGATCTAAGCTATATTGCGCCGTTTCTGTCAATTTGCGTTTTGTACGGACCCCTCA
CAACAATTATCATCTCCAAAAATAGACTATGATCCATTGACGCTCCGATCACTTGATTTGAAGACTTTGGA
AGCTCCTTCACAGTTGAGTCCAGGCACCGTAGAAGATAATCTTGAAGACAATTGGAGTTTCATTTTCTTT
ACCGCAGTTACGAACCTTTTCCCAACATATTTGGCAAACGTGGAAAGTTTCTCCCTCTGATAGTTCTTTT
20 CCGAAAAAATTCAAAGACTTAGGTGAAAGTTGGCTGCAAAGGTCCCAAAATTATGATCATTTTGTGATACC
CGATGATGCAGCATGGGAACCTATTACCATGAATACGAACGTGTACCAGAAGTCTTGAAGCTTTTGATT
TTAACGACTTTTAAACGACAACCTTGAGAAGATCAAAAAACAATAATTATTGCGGAAACGAGGAATTCACGT
GGCCCGAGCCGCGCTCTCGGATCGGTACCTCGAGCCGCGCGGCCGCGCCAGCTTTCTAGAGAACAAAACTC
ATCTCAGAAGAGGATCTGAATAGCGCCGTCGACCATCATCATCATCATCATTGAGTTTGTAGCCTTAGACA
25 TGACTGTTCTCTCAGTTCAAGTTGGGCACTTACGAGAAGACCGGTCTTGCTAGATTCTAATCAAGAGGATGT
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GGATTTTTTTTTGTCAATTTGTTTCTTCTCGTACGAGCTTGCTCCTGATCAGCCTATCTCGCAGCTGATGAA
TATCTTGTGGTAGGGGTTTGGGAAAATCATTGAGTTTGATGTTTTTCTTGGTATTTCCCACTCCTCTTCA
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30 CTCCTTTTTTACTCTTCCAGATTTTCTCGGACTCCGCGCATCGCCGTACCACTTCAAAACACCCAAGCACA
GCATACTAAATTTCCCTCTTCTTCTCTAGGGTGTGTTAATTACCCGTACTAAAGGTTTGGAAAAGAA
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AATTTCTCAAGTTTTCAGTTTCTATTTTCTTGTCTATTACAACCTTTTTTTACTTCTTGTTCATTAGAAAGA
35 AAGCATAGCAATCTAATCTAAGGGGCGGTGTTGACAATTAATCATCGGCATAGTATATCGGCATAGTATAA
TACGACAAGGTGAGGAACCTAAACCATGGCCAAGTTGACCAGTGCCGTTCCGGTGCTCACCGCGCGCAGCT
CGCCGGAGCGGTGAGTTCTGGACCGACCGGCTCGGGTTCTCCGGGACTTCGTGGAGGACGACTTCGCCG
GTGTGGTCCGGGACGACGTGACCTGTTTCATCAGCGCGGTCCAGGACCAGGTGGTGCCGGAACAACCTG
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40 GGACGCCTCCGGGCCGGCCATGACCGAGATCGGCGAGCAGCCGTGGGGGCGGGAGTTGCGCCTGCGCGACC
CGGCCGGCAACTGCGTGCACTTCGTGGCCGAGGAGCAGGACTGACACGTCCGACGGCGGCCACGGGTCCC
AGGCCTCGGAGATCCGTCCCCCTTTTCTTTTGTGATATCATGTAATTAGTTATGTACGCTTACATTAC
GCCCTCCCCCACATCCGCTCTAACCAGAAAAGGAAGGAGTTAGACAACCTGAAGTCTAGGTCCCTATTTAT
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45 CGTGATACGCATGTAACATTATACTGAAAACCTTGCTTGAGAAGGTTTTGGGACGCTCGAAGGCTTTAATTT
GCAAGCTGGAGACCAACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGCTG
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TGCCGCTTACCGGATACCTGTCCGCTTTCTCCCTTCGGAAGCGTGGCGCTTTCTCAATGCTCAGCTGT
50 AGGTATCTCAGTTCCGTGTAGGTGTTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCGTTTCCGCCCCG
CCGCTGCGCCTTATCCGGTAACTATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGCAG
CAGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGCCT
AACTACGGCTACACTAGAAGGACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAG
AGTTGGTAGCTCTTGATCCGGCAAAACAAACACCGCTGGTAGCGGTGGTTTTTTTTGTTTGAAGCAGCAGA

TTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGGAAAC
GAAAACCTACGTTAAGGGATTTTGGTCATGAGATC

SEQ ID NO: 7

5 T. reesei alpha-1,2-mannosidase protein sequence

SEQ ID NO: 8

The ORF sequence of the MManHDEL fusion in pGAPZMManHDEL:

10 ATGAGATTTCTTCAATTTTTACTGCTGTTTTATTTCGCAGCATCCTCCGCATTAGCTGCTCCAGTCAACAC
TACAACAGAAGATGAAACGGCACAATTCGGGCTGAAGCTGTTCATCGGTTACTCAGATTTAGAAGGGGATT
TCGATGTTGCTGTTTTGCCATTTTCCAACAGCACAAATAACGGGTATTGTTTATAAATACTACTATTGCC
AGCATTGCTGCTAAAGAAGAAGGGGTATCTCTCGAGAAAAGAGAGGCTGAAGCTGAATTCGCCACAAAACG
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ATTTTGCCTTTCCCATGACGACCTCCACCCGGTCAGCAACAGCTTTGATGATGAGAGAAACGGCTGGGGC
15 TCGTCGGCAATCGATGGCTTGGACACGGCTATCCTCATGGGGGATGCCGACATTGTGAACACGATCCTTCA
GTATGTACCGCAGATCAACTTCACCACGACTGCGGTTGCCAACCAAGGATCCTCCGTGTTTCGAGACCAACA
TTCGGTACCTCGGTGGCCTGCTTTCTGCCTATGACCTGTTGCGAGGTCCTTTCAGCTCCTTGGCGACAAAC
CAGACCCTGGTAAACAGCCTTCTGAGGCAGGCTCAAACACTGGCCAACGGCCTCAAGGTTGCGTTTACCAC
TCCCAGCGGTGTCCCGGACCCCTACCGTCTTCTTCAACCCTACTGTCCGGAGAAGTGGTGCATCTAGCAACA
20 ACGTCGCTGAAATTGGAAGCCTGGTGTCTGAGTGGACACGGTTGAGCGACCTGACGGGAAACCCGCAGTAT
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GATTGGAACGTTTTGTGACGACGAGCAACGGTACCTTTTCAAGATAGCAGCGGCAGCTGGTCCGGCCTCATGG
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25 TTTGTCTTCGTACAACGGACAGTCTACGTGCGCAAACCTCAGGACATTTGGCCAGTTTTGGCGGTGGCAACT
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30 CAGGACCTGGCGTGGGAAGCGTTGAGTGCCATTGAGGACGCATGCCGCGCCGGCAGCGCTACTCGTCCAT
CAACGAGTACGACAGGCCAACGGCGGGGGTGCTCTGACGATATGGAGAGCTTCTGTTTTGCCGAGGCGC
TCAAGTATGCGTACCTGATCTTTGCGGAGGAGTCGGATGTGCAGGTGCAGGCCACCGCGGGAACAAATTT
GTCTTTAACACGGAGGCGACCCCTTTAGCATCCGTTTCATCATCACGACGGGGCGGCCACCTTGCTCACGA
CGAGTTGTAA

35

SEQ ID NO: 9

pGlycoSwitch M5 (5485 bp):

40 AGATCTAACATCCATAATCGATCTAAGCTATATTTCGCCGTTTTCTGTCAATTTGCGTTTTGTACGGACCCCTCA
CAACAATTATCATCTCAAAAATAGACTATGATCCATTGACGCTCCGATCACTTGATTTGAAGACTTTGGA
AGCTCCTTACAGTTGAGTCCAGGCACCGTAGAAGATAATCTTGAAGACAATTGGAGTTTCATTTTCCTT
ACCGCAGTTACGAACCTTTTCCCCAACATATTTGGCAAACGTGGAAAGTTTCTCCCTCTGATAGTTCCCTT
CCGAAAAACTTCAAAGACTTAGGTGAAAGTTGGCTGCAAAGGTCCCAAATTATGATCAATTTGTGATACC
CGATGATGCAGCATGGGAACCTATTACCATGAATACGAACGTGTACCAGAAGTCTTGGAAGCTCTAGATG
45 CTCACCGCAATGCTGTTAAGGTTTCGTATGGAGAACTGGGACTTATTTAATTATTTAGAGATTTAACTTA
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GCGAAGCGAGCAGGACTGGGCGGCGGCCAAAGCGGTCCGACAGTGCTCCGAGAACGGGTGCGCATAGAAAT
TGCATCAACGCATATAGCGCTAGCAGCACGCCATAGTGAAGTGGCGATGCTGTGGAATGGACGATATCCCG
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50 CATTAAAGCTGATCTTTTTTTGTAGAAATGTCTTGGTGTCTCGTCCAATCAGGTAGCCATCTCTGAAATAT
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TCTGCTGGAGAGCTTCTTCTACGGCCCCCTTGACGAATGCTCTTCCAGCATTACGTTGCGGGTAAACG
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 20 GCAACTTCATCTTGGGAGGCATTCTCCTGAACGAGCAAAAGTACATTGACTTTGGAATCAAGCTTGCCAGC
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 25 GTCCATCAACGACGTGACGCAGGCCAACGGCGGGGGTGCTCTGACGATATGGAGAGCTTCTGGTTTGCCG
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 30 AAGTGGGCGGTTCAGAGAAGACCGGTCTTGCTAGATTCTAATCAAGAGGATGTGAGAATGCCATTTGCCT
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 35 CAGATTTTCTCGGACTCCGCGCATCGCCGTACCACTTCAAAACACCCAAGCACAGCATACTAAATTTTCCC
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 TCTGGACCGACCGGCTCGGGTTCTCCCGGACTTCGTGGAGGACGACTTCGCCGGTGTGGTCCGGGACGAC
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 45 CGGCCTGGACGAGCTGTACGCCGAGTGGTCCGAGGTGCTGTCCACGAACCTCCGGGACGCCTCCGGGCCGG
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 50 AGTATTAGAAGCTTATTTATATTTCAAATTTTTCTTTTTTTCTGTACAGACGCGTGTACGATGTAACA
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 AAGGACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTAGCTCTTGAT
 5 CCGGCAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGAAGCAGCAGATTACGCGCAGAAAAAA
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 GATTTTGGTCATGAGATC

SEQ ID NO: 10
 10 *S. cerevisiae* Kre2 protein
 MALFLSKRLLRFTVIAGAVIVLLLLTLNSNSRTQQYIPSSIAAFDFTSGSISPEQQVISEENDAKKLEQSAL
 NSEASEDSEAMDEESKALKAAAEKADAPIDTKTMDYITPSFANKAGKPKACYVTLVRNKKELKGLLSSIKY
 VENKINKKFPYPWVFLNDEPFTEEFKEAVTKAVSSEVKFGILPKEHWSYPEWINQTKAAEIRADAATKYIY
 GGSESYRHMCRYQSGFFWRHELLEEYDWWVRVEPDIKLYCDINYDVFKWMQENKVGFTVSIHEYEV TIP
 15 TLWQTSMDFIKKNPEYLDENNLM SFLSNDNGKTYNLCHFWSNFEIANLNLWRS PAYREYFD TLDHQGGFFY
 ERWGDAPVHSIAAALFLPKDKIHYFSDIGYHHPYDNCPLDKEVYNSNNCECDQGNDFTFQGYSCGKEYYD
 AQGLVKPKNWKKFRE

SEQ ID NO: 11
 20 *S. cerevisiae* Kre2 Golgi localization signal (first 100 amino acids)
 MALFLSKRLLRFTVIAGAVIVLLLLTLNSNSRTQQYIPSSIAAFDFTSGSISPEQQVISEENDAKKLEQSA
 LNSEASEDSEAMDEESKALKAAAEKADAP

SEQ ID NO: 12
 25 Human GnTI cDNA
 ATGCTGAAGAAGCAGTCTGCAGGGCTTGTGCTGTGGGGCGCTATCCTCTTTGTGGCCTGGAATGCCCTGCT
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 CCAGCCTCACCCGGGAAGTGATTGCGCTGGCCCAAGACGCGGAGGTGGAGCTGGAGCGGCAGCGTGGGCTG
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 30 GCGTGTGCTGTGACCCCGCGCCGGCGGTGATTCCCATCCTGGTCATCGCCTGTGACCGCAGCACTGTTT
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 TGCGGGCAGCAGGAGACGCGCCAGGCCATCGCCTCCTACGGCAGCGCGGTACGCACATCCGGCAGCCCGA
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 35 GTGGCCCCGACTTCTTCGAGTACTTTCCGGCCACCTATCCGCTGCTGAAGGCCGACCCCTCCCTGTGGTG
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 CCGACTTTTTCCCTGGCCTGGGCTGGCTGCTGTTGGCCGAGCTCTGGGCTGAGCTGGAGCCCAAGTGGCCA
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 CTCAAGAACGATGACCTTTGGCCGCAAGGGTGTGAGCCACGGGCAGTTCTTTGACCAGCACCTCAAGTTTA
 40 TCAAGCTGAACCAGCAGTTTGTGCACTTCACCCAGCTGGACCTGTCTTACCTGCAGCGGGAGGCCTATGAC
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 GGAGCTGGGGGAGGTGCGGGTGCAGTATACGGGCAGGGACAGCTTCAAGGCTTTCCGCAAGGCTCTGGGTG
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 CGCCGTGTCCACCTGGCGCCCCACCGACGTGGGAGGGCTATGATCCTAGCTGGAATATGCTGAAGAAGCA
 45 GTCTGCAGGGCTTGTGCTGTGGGGCGCTATCCTCTTTGTGGCCTGGAATGCCCTGCTGCTCCTCTTCTTCT
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 GGATGCCCTGTGAGCCAGCGGGGGAGGGTGCCACCCGCGGCCCTCCCGCCAGCCGCGTGTGCTGTGA
 CCCCCGCGCCGGCGGTGATTCCCATCCTGGTCATCGCCTGTGACCGCAGCACTGTTCCGGCGCTGCCTGGAC
 50 AAGCTGCTGCATTATCGGCCCTCGGCTGAGCTCTTCCCCATCATCGTTAGCCAGGACTGCGGGCAGCAGGA
 GACGGCCCAGGCCATCGCCTCCTACGGCAGCGCGGTACGCACATCCGGCAGCCCGACCTGAGCAGCATTG
 CGGTGCCCGCGGACACCGCAAGTTCCAGGGCTACTACAAGATCGCGCGCCACTACCGCTGGGCGCTGGGC
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 CTTTCGAGTACTTTCCGGCCACCTATCCGCTGCTGAAGGCCGACCCCTCCCTGTGGTGGCTCTCGGCCTGGA

5 ATGACAACGGCAAGGAGCAGATGGTGGACGCCAGCAGGCCTGAGCTGCTCTACCGCACCGACTTTTTCCCT
 GGCCTGGGCTGGCTGCTGTTGGCCGAGCTCTGGGCTGAGCTGGAGCCCAAGTGGCCAAAGGCCTTCTGGGA
 CGACTGGATGCGGCGGCCGAGCAGCGGCAGGGGCGGGCCTGCATACGCCCTGAGATCTCAAGAACGATGA
 CCTTTGGCCGCAAGGGTGTGAGCCACGGGCAGTTCTTTGACCAGCACCTCAAGTTTATCAAGCTGAACCAG
 10 CAGTTTGTGCACTTCACCCAGCTGGACCTGTCTTACCTGCAGCGGGAGGCCTATGACCGAGATTTCTCTCGC
 CCGCGTCTACGGTGCTCCCCAGCTGCAGGTGGAGAAAGTGAGGACCAATGACCGGAAGGAGCTGGGGGAGG
 TGCGGGTGCAGTATACGGGCAGGGACAGCTTCAAGGCTTTTCGCCAAGGCTCTGGGTGTCTAGGATGACCTT
 AAGTCGGGGGTTCCGAGAGCTGGCTACCGGGGTATTGTACCTTCCAGTTCGGGGGCCCGGTGTCCACCT
 GCGCCCCCACCGACGTGGGAGGGCTATGATCCTAGCTGGAAT

SEQ ID NO: 13

Human GnTI protein

1 MLKKQSAGLV LWGAILFVAW NALLLLFFWT RPAPGRPPSV SALDGDPA SL TREVIRLAQD
 61 AEVELEERQRL LLQIGDAL SQRGRVPTAA PPAQPRVPVT PAPA V IPIV IACDRSTVRR
 15 121 CLDKLLHYRP SAELFPIIVS QDCGHEETAQ AIASYGSAVT HIRQPDLSI AVPPDHRKFQ
 181 GYYKIARHYR WALGQVFRQF RFPAAVVVED DLEVAPDFE YFRATYPLLK ADPSLWCVSA
 241 WNDNGKEQMV DASRPELLYR TDFFPGLGWL LLAE LWAELE PKWPKAFWDD WMRRPEQRQ
 301 RACIRPEISR TMTFGRKGV S HGQFFDQHLK FIKLNQQFVH FTQLDLSYLQ REAYDRDFLA
 361 RVYGAPQLQV EKVRTNDRKE LGEVRVQYTG RDSFKAFKA LGVMDL KSG VPRAGYRGIV
 20 421 TFQFRGRRVH LAPPTWEGY DPSWN

SEQ ID NO: 14

pPIC6AKrecoGnTI

25 GAAATTTTTTTTTTTAGTTTTTTCTCTTTCACTGACCTCCATTGATATTTAAGTTAATAAACGGTCTTCA
 ATTTCTCAAGTTTCAGTTTCATTTTTCTTGTTCTATTACAACTTTTTTTTACTTCTTGTTCTATTAGAAAGAA
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 30 ACGACAAGGTGAGGAACATAAACCATGGCCAAGCCTTTGTCTCAAGAAGAATCCACCCTCATTGAAAGAGCA
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 35 TTCGTGGCCGAGGAGCAGGACTGACACGTCCGACGGCGGCCACGGGTCCCAGGCCTCGGAGATCCGTCCC
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 CTAACCGAAAGGAAGGAGTTAGACAACCTGAAGTCTAGGTCCCTATTTATTTTTTATAGTTATGTTAGT
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 40 TGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCG
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 45 ACTATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATT
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 50 TTTGGTCATGAGATCAGATCTAACATCAAAGACGAAAGGTTGAATGAAACCTTTTTGCCATCCGACATCC
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 55 CTCCAGATGAGGGCTTTCTGAGTGTGGGGTCAAATAGTTTCATGTTCCCAAATGGCCCAAACCTGACAGT

5 TTAACGCTGTCTTGGAACCTAATATGACAAAAGCGTGATCTCATCCAAGATGAACTAAGTTTGGTTCGTT
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 10 CTTCCAAGATTCTGGTGGGAATACTGCTGATAGCCTAACGTTCATGATCAAAATTTAACTGTTCTAACCCC
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 15 GCCTGGACAAGCTGCTGATTATCGGCCCTCGGCTGAGCTCTTCCCCTCATCGTTAGCTAGCACTGCGGG
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 20 TTTTCCCTGGCCTGGGCTGGCTGCTGTTGGCCGAGCTCTGGGCTGAGCTGGAGCCCAAGTGGCCAAAGGCC
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 25 GGGGGAGGTGCGGGTGAGTATACGGGCAGGGACAGCTTCAAGGCTTTCCGCAAGGCTCTGGGTGTCTATGG
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 30 TTTGCCTGAGAGATGCAGGCTTCATTTTTGATACTTTTTTATTTGTAACCTATATAGTATAGGATTTTTTT
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 GATTAAGTGAGACCTTCGTTTGTGCGGATCCCCACACACCATAGCTTCAAAATGTTTCTACTCCTTTTTT
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 35 TTTTCCCTCTTTCTTCTAGGGTGTCGTTAATTACCGTACTAAAGGTTTGGAAAAGAAAAAGAGACC
 GCCTCGTTTCTTTTTCTTCGTCGAAAAAGGCAATAAAAATTTTTATCACGTTTCTTTTTCTT

SEQ ID NO: 15

40 5' TTCGAAGCTTCGCTAGCTCGGTGTCCCGATGTC

SEQ ID NO: 16

5' GAATTCGAAGGGAAGATGAGGCTTCGGGAGCC

SEQ ID NO: 17

45 5' CGTTCGCGACCGGAGGGGCCCCGGCCGCC

SEQ ID NO: 18

5' TCGATATCAAGCTTAGCTCGGTGTCCCGATGTC

50 SEQ ID NO: 19

5' GAATTCGAACCTTAAGATGGCCCTCTTCTCAGTAAG

SEQ ID NO: 20

Human GalT1 cDNA:

ATGAGGCTTCGGGAGCCGCTCCTGAGCGGCGCCGCGATGCCAGGCGCGTCCCTACAGCGGGCCTGCCGCCT
GCTCGTGGCCGTCTGCGTCTGGCACCTTGGCGTCACCCTCGTTTACTACCTGGCTGGCCGCGACCTGAGCC
GCCTGCCCCAACTGGTTCGGAGTCTCCACACCGCTGCAGGGCGGCTCGAACAGTGC CGCCGCCATCGGGCAG
5 TCCTCCGGGGAGCTCCGGACCGGAGGGGCGCGCCGCTCCTCTAGGCGCCTCCTCCAGCCGCGCCC
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CCCACACCACCGCACTGTCTGCTGCCCGCCTGCCCTGAGGAGTCCCCGCTGCTTGTGGGGCCCCATGCTGATT
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TGCCCCCAGGGA CTGCGTCTCTCCTCACAAGGTGGCCATCATCATTCCATTCCGCAACCGGCAGGAGCACC
10 TCAAGTACTGGCTATATTATTTGCACCCAGTCCTGCAGCGCCAGCAGCTGGACTATGGCATCTATGTTATC
AACCAGGCGGGAGACACTATATTCAATCGTGCTAAGCTCCTCAATGTTGGCTTTCAAGAAGCCTTGAAGGA
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15 CTGGGGAGGAGAAGATGATGACATTTTAAACAGATTAGTTTTTAGAGGCATGTCTATATCTCGCCCAAATG
CTGTGGTTCGGGAGGTGTGCGATGATCCGCCACTCAAGAGACAAAAAATGAACCCAATCCTCAGAGGTTT
GACCGAATTGCACACACAAAGGAGACAATGCTCTCTGATGGTTTGAACCTACTCACCTACCAGGTGCTGGA
TGTACAGAGATACCCATTGTATACCCAAATCAAGTGGACATCGGGACACCGAGC

20 SEQ ID NO: 21

Human GalT1 protein:

MRLREPLLGAAMPGLQACRLLVAVCVVHLGVTLVYYLAGRDL SRLPQLVGVSTPLQGSNSAAAIGQ
SSGELRTGGARPPPPLGASSQPRPGDSSPVVDSGPGPASNLTSVPVPHTTALSLPACPEESPLLVGPMIL
EFNMPVDLELVAKQNPVVKMGGRYAPRDCVSPHKVAIIIPFRNRQHLKYWLYLHPVLQRQQLDYGIYVI
25 NQAGDTIFNRAKLLNVGFQEALKDYDYTCFVFSVDVLI PMNDHNAYRCFSQPRHISVAMDKFGFSLPYVQY
FGGVSA LSKQQFLTINFPNNYWGWWGEDDDIFNRLVFRGMSISRPNVAVGRCRMRHSRDKNEPNPQRF
DRIAHTKETMLSDGLNSLTYQVLDVQRYPLYTQITVDIGTPS

30 SEQ ID NO: 22

pBlKanMX4KrehGalT:

CTAGTGCACAAACGAACGTCTCACTTAATCTTCTGTACTCTGAAGAGGAGTGGGAAATACCAAGAAAAACA
TCAAACCTGAATGATTTTCCCAAACCCCTACCACAAGATATTATCATCAGCTGCGAGATAGGCTGATCAGGAG
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35 CAAAAATGAAGCCTGCATCTCTCAGGCAAATGGCATTCTGACATCCTCTTGATTAGAATCTAGCAAGACCG
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40 GCCTCTAAAACTAATCTGTTAAAAATGTATCATCTTCTCCTCCCCAGCCCCAATAATTATTAGGAAATC
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45 AGCTGCTGGCGCTGCAGGACTGGGTGCAAATAATATAGCCAGTACTTGAGGTGCTCCTGCCGGTTGCGGAA
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50 CTAGAGGAGGCGGCGGCGGGCCCCCTCCGGTCCGCGGCGGGGCATCTGCCTTTTTCAGCGGCAGCTTTT CAGA
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 5 GCGTTTTCGGCACAGGTGCACCGGGGTTTCAAGCGATAGAGAGACTGCGCTAAGCATTAAATGAGATTATTT
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5 GTTGTTTCTGAAACATGGCAAAGGTAGCGTTGCCAATGATGTTACAGATGAGATGGTCAGACTAAACTGGC
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